PowerEdge T410

Technical Guide

Inspired by professionals like you, the T410 is built to simplify daily operations and maximize uptime.

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1 Product Comparison

1.1 Overview

Inspired by the requirements of and feedback from small-business, medium-business and corporate users, the Dell™ PowerEdge™ T410 is a powerful, reliable server that delivers balanced high performance. The T410 is a 2-socket tower server featuring Intel® Xeon® processor 5500 and 5600 series, DDR3 memory, and 6 hard drive bays that can accommodate 3.5" or 2.5" hard drives. Featuring excellent acoustics for office environments as well as energy-efficient technologies, the T410 deploys easily and is managed in a simplified, straightforward manner throughout its lifecycle.

1.2 Customer-Inspired Design

Inspired by our customers, the PowerEdge T410 was built to simplify daily operations and maximize uptime. Consistent component layout and purposeful placement of interface ports and power supplies enable easy installation and replacement. With a depth of 24" (617 mm), the PowerEdge T410 chassis is easy to access and designed to reside in a back office, retail, or small office setting where a small chassis and quiet acoustics matter.

Robust, metal hard drive carriers and organized cabling are designed to improve access to internal components of the server, as well as airflow across them. The purposeful design of the T410 includes an optional LCD screen positioned on the front panel for ease of monitoring.

1.3 Energy-Efficient

Energy efficiency is designed into the PowerEdge T410. Several Energy Smart standards-based components reduce power consumption while providing increased performance. For example, Energy Smart 90%+ efficient power supply units are right-sized for the system requirements of the PowerEdge T410. Power management features include power capping, power inventory, and power budgeting to best manage power in your specific environment.

1.4 Easy to Manage

The Dell PowerEdge T410 lets you focus on running your business rather than running your servers. Dell OpenManage systems management software helps to automate common management tasks, thereby enhancing efficiency, improving productivity, and reducing the potential for error (which can cause downtime).

1.5 Comparison

Table 1. **Comparison of PowerEdge T410 to T310 and T610**

Feature	T310	T410	T610
Processor	Intel® Xeon® processor 3400 series, Intel Celeron® G1101, Intel Pentium® G6950, Intel Core® i3 processor 500 series	Intel® Xeon® processor 5500 and 5600 series	Intel® Xeon® processor 5500 and 5600 series
Front Side Bus	Direct Media Interface (DMI)	6.4 GT/s QuickPath Interconnect (QPI) links	6.4 GT/s QuickPath Interconnect (QPI) links
# Sockets	1	2	2
# Cores	2 or 4	4 or 6	4 or 6
L2/L3 Cache	8MB	4MB, 8MB, and 12MB	4MB, 8MB, and 12MB
Chipset	Intel® 3400	Intel® 5500	Intel® 5520
DIMMs	6	8	12
Min/Max RAM	1GB/32GB	1GB/128GB	1GB/192GB
Drive Bays	Optional hot-plug 4 x 2.5” or 4 x 3.5”	Optional hot-plug 6 x 2.5” or 6 x 3.5”	Hot-plug 8 x 2.5” or 8 x 3.5”
Hard Drive Types	SSD, SAS, nearline SAS, SATA	SSD, SAS, nearline SAS, SATA	SSD, SAS, nearline SAS, SATA
External Drive Bays	2 x 5.25”	2 x 5.25”	2 x 5.25”
Embedded Hard Drive Controller	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300
Optional Storage Controller	**Non-RAID:** SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA **RAID:** SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800 PERC S300 (software-based)	**Non-RAID:** SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA **RAID:** SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800	**Non-RAID:** SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA **RAID:** SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800

Feature	T310	T410	T610
Availability	Optional hot-plug hard drives Optional hot-plug redundant power ECC memory Quad-pack LED or LCD diagnostic	Optional hot-plug hard drives Optional hot-plug redundant power ECC memory Memory mirroring Quad-pack LED or LCD diagnostic	Hot-plug hard drives Optional hot-plug redundant power Hot-plug redundant cooling ECC memory Memory mirroring LCD diagnostic One dual-port embedded NIC with TOE
Server Management	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™ Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™ Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™, iDRAC6 Express Optional: iDRAC6 Enterprise, vFlash media
I/O Slots	2 PCIe x1 1 PCIe x8 (x8 routing) 1 PCIe x8 (x4 routing) 1 PCIe x16 (x8 routing)	4 PCIe x8 (x4 routing) 1 PCIe x16 (x8 routing)	2 PCIe x8 3 PCIe x4 Gen 2
NIC/LOM	2 x GbE LOM Optional: various NICs available	2 x GbE LOM Optional: various NICs available	2 x GbE LOM with TOE Optional: various NICs available
USB	2 front, 4 back, 2 internal	2 front, 4 back, 2 internal	2 front, 6 back, 1 internal
Power Supplies	Non-redundant 375W or Optional hot-plug redundant 2 x 400W	Non-redundant 525W or Optional hot-plug redundant 2 x 580W	Hot-plug redundant 2 x 570W (Energy Smart) or 2 x 870W (High-output)
Fans	Non hot-plug, non-redundant	Non hot-plug, non-redundant	Optional hot-plug redundant

2 Key Technologies

Key technologies of the PowerEdge T410 include the following:

- Intel® Xeon® 5500 and 5600 series processors
- Intel 5500 chipset
- Memory RAS feature (mirroring)
- Support for optional Integrated Dell Remote Access Controller (iDRAC6)
- Support for virtualization applications
- Support for SSD drives

3 System Overview

Table 2 summarizes the product features for the PowerEdge T410. For the latest information on supported features for the PowerEdge T410, visit Dell.com.

Table 2. **Product Features Summary**

Feature	Technical Specification	
Form Factor	Tower	
Processors	Latest quad-core or six-core Intel® Xeon® processors 5500 and 5600 series	
Processor Sockets	2	
Front Side Bus or HyperTransport	Intel® QuickPath Interconnect (QPI)	
Cache	Up to 12MB	
Chipset	Intel® 5500 Chipset	
Memory[1]	Up to 128GB (8 DIMM slots): 1GB/2GB/4GB/8GB/16GB DDR3 800MT/s, 1066MT/s or 1333MT/s	
I/O Slots	4 PCIe x8 (x4 routing) + 1 PCIe x16 (x8 routing)	
RAID Controller	**Internal Controller:** PERC H200 (6Gb/s) PERC H700 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1GB) SAS 6/iR PERC 6/i (battery-backed cache: 256MB) PERC S100 (software-based) PERC S300 (software-based)	**External Controller:** PERC H800 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1GB) PERC 6/E (battery-backed cache: 256MB, 512MB) **External HBAs (non-RAID):** 6Gbps SAS HBA SAS 5/E HBA LSI2032 PCIe SCSI HBA
Drive Bays	6 x 3.5” cabled hard drives or 6 x 3.5” hot-plug hard drives or 6 x 2.5” hot-plug hard drives	2 x 5.25” drive bays for DVD-ROM, DVD+/-RW, or tape backup unit (TBU)
Maximum Internal Storage	Up to 18TB	
Hard Drives[1]	**Hot-plug Hard Drive Options:** 2.5" SATA SSD, SAS (10K) 3.5" SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K)	**Cabled Hard Drive Options:** 3.5" SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K)

Communications	Embedded dual-port Broadcom® NetXtreme II™ 5716 Gigabit Ethernet **Optional Add-in NICs:** Broadcom dual-port 1GbE NIC Broadcom quad-port 1GbE NIC Broadcom dual-port 10GbE NIC Intel® single-port 1GbE NIC Intel dual-port 1GbE NIC Intel quad-port 1GbE NIC Intel dual-port 10GbE NIC	**Optional Add-in HBA/CNA:** Brocade® single-port 8Gb FC HBA Brocade dual-port 8Gb FC HBA Emulex® single-port 4Gb HBA Emulex dual-port 4Gb HBA Emulex single-port 8Gb HBA Emulex dual-port 8Gb HBA Emulex 10Gb CNA (FCoE) Emulex 10Gb HBA (iSCSI) QLogic® single-port 4Gb HBA QLogic dual-port 4Gb FC HBA QLogic single-port 8Gb FC HBA QLogic dual-port 8Gb FC HBA QLogic dual-port 10Gb CNA/FC (FCoE)
Power Supply	One non-redundant 525W or Two redundant hot-plug 580W	
Availability	Quad-pack LED Diagnostic or LCD diagnostic (with hot-plug HDD chassis); TPM; optional hot-plug hard drives; optional hot-plug redundant power supply; optional PERC 6/i RAID controller with battery-backed cache; toolless chassis	
Video	Integrated Matrox® G200	
Remote Management	Optional iDRAC6 Enterprise, iDRAC6 Express	
Systems Management	Dell™ OpenManage™ Microsoft® System Center Essential (SCE) 2010 v2 BMC, IPMI 2.0 compliant	
Operating Systems	Microsoft® Windows® Small Business Server 2011 Microsoft Windows Small Business Server 2008 Microsoft Windows Server® 2008 SP2, x86/x64 (x64 includes Hyper-V®) Microsoft Windows Server 2008 R2 SP1, x64 (includes Hyper-V v2) Novell® SUSE® Linux® Enterprise Server Red Hat® Enterprise Linux For more information on the specific versions and additions, visit Dell.com/OSsupport.	
Featured Database Application	Microsoft SQL Server® solutions (see Dell.com/SQL)	
[1]GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.		

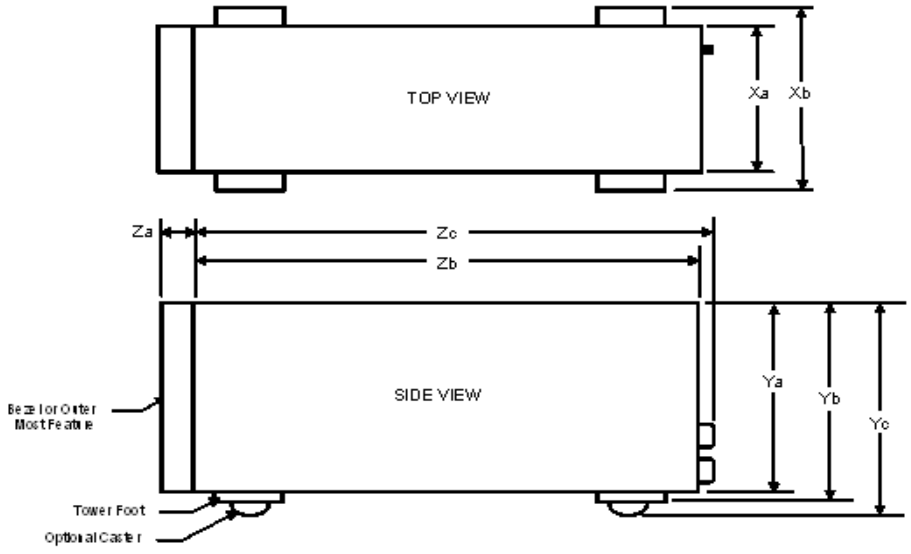
4 Mechanical

4.1 Chassis Description

The PowerEdge T410 is a tower chassis design that is available in cabled hard drive or hot-plug hard drive configurations. The chassis supports the following features:

- Flexible power supply (redundant or non-redundant)
- Two fixed hard drive cages (cabled and hot-plug chassis)
- Common power-supply bay to accommodate two power supplies (non-redundant and redundant)
- User-friendly chassis—most devices are toolless:
  - Hard drives (cabled and hot-plug)
  - Optical drive and tape backup unit
  - Fans
  - Expansion cards
  - Planar
  - Backplane
  - Power distribution board
  - Redundant power supply (non-redundant power supply is secured with three screws)

4.2 Dimensions and Weight



Xa	Xb	Ya	Yb	Yc	Za (With bezel)	Za (Without bezel)	Zb*	Zc	Max Weight
217.9mm	282.5mm	433.3mm	444.9mm	N/A	37.0mm	21.5mm	574.8mm	579.8mm	28.4kg (62.61lbs)

*Note: Zb goes to the nominal rear wall external surface where the motherboard I/O connectors reside.

Figure 1. Chassis Dimensions

4.3 Front Panel View and Features

Figure 2, Figure 3, and Figure 4 show the front views of the PowerEdge T410.

Figure 2. Front View (With Bezel)

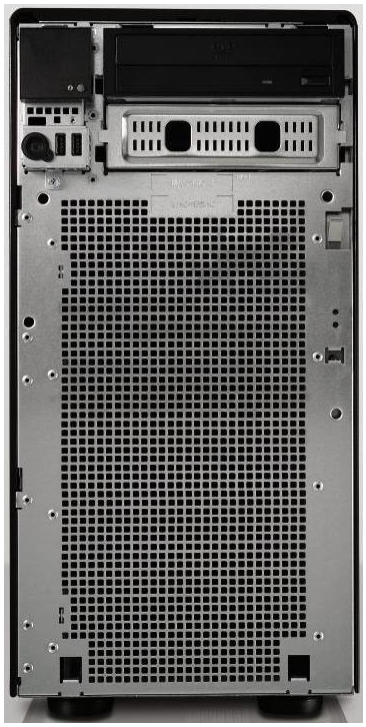


Figure 3. Front View (Cabled Hard Drive Chassis Without Bezel)

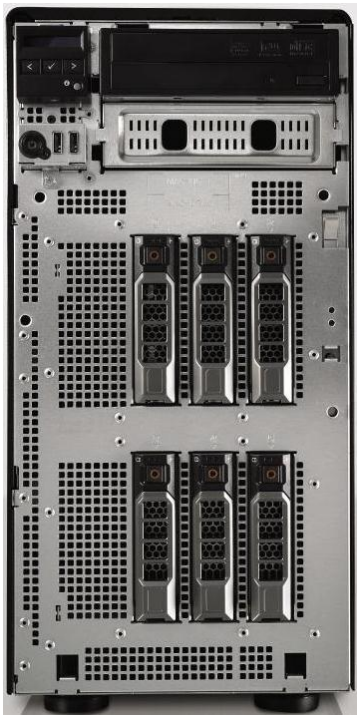


Figure 4. Front View (Hot-plug Hard Drive Chassis Without Bezel)

See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com for more information.

4.4 Back Panel View and Features

Figure 5 and Figure 6 show the back views of the PowerEdge T410.

Figure 5. Back View (With Non-redundant Power Supply)

Figure 6. Back View (With Redundant Power Supplies)

See the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com for more information.

4.5 Hard Drive LED Indicators

Each disk drive carrier has two LED indicators visible from the front of the system. One is a green LED for disk activity and the other is a bicolor (green/amber) LED for status information. The activity LED is driven by the disk drive during normal operation. The bicolor LED is controlled by the storage enclosure processor (SEP) device on the backplane. Both LEDs are used to indicate certain conditions under direction of a storage controller.

For more information, see the Hard-Drive Indicator Patterns section in the About Your System chapter in the *Dell PowerEdge T410 Systems Hardware Owner's Manual* on Support.Dell.com.

4.6 Power Supply Indicators

The PowerEdge T410 optional redundant power supplies have one status bi-color LED: green for AC power present and amber for a fault as detailed in Table 3.

Table 3. **Power Supply Status**

LED	Power Supply Status
	AC Power is not present
	AC Power is present
	Fault of any kind is detected
	DC Power is applied to the system
↔	Redundant power supply mismatch (when hot-plugged/swapped)

See the Power Indicator Codes section in the About Your System chapter of the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com for more information.

4.7 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com for more information.

4.8 Internal Chassis Views

Figure 7 and Figure 8 show the internal views of the PowerEdge T410 server.

Figure 7. Internal View (Cabled Hard Drive Configuration)

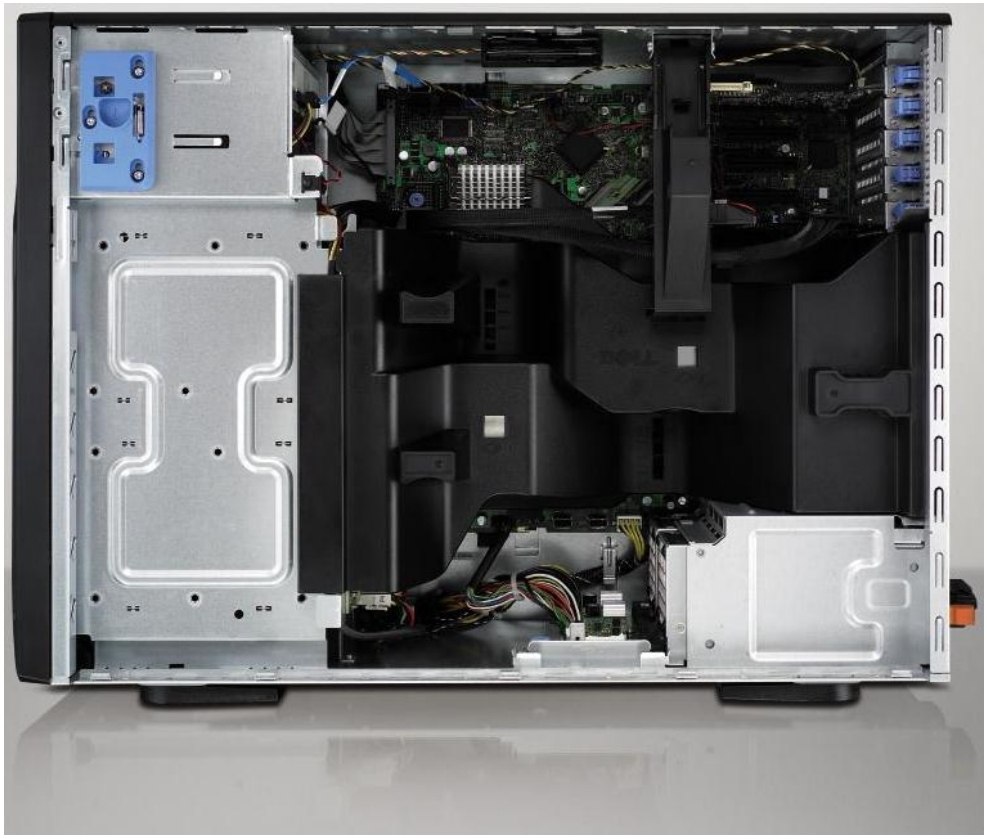


Figure 8. Internal View (Hot-plug Hard Drive Configuration)

4.9 Rails and Cable Management

The PowerEdge T410 is not a rackable system and does not have a rack kit. However, the T410 can be stored in a rack using a third-party rack tray.

For information on power-cord cable-management, see the Installation and Configuration section in the *Dell PowerEdge T410 Getting Started Guide* on Support.Dell.com.

4.10 Fans

There is one cabled system fan located at back of the system. It is not hot-swappable.

4.11 Control Panel

The PowerEdge T410 is available with an LCD control panel (hot-plug hard drive chassis) or an LED control panel (cabled hard drive chassis).

4.11.1 LCD Panel Configuration

Figure 9 shows the LCD control panel.

Figure 9. LCD Control Panel

The LCD panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces. Features of the LCD panel include the following:

- Power button
- LCD screen with controls
- Two navigation buttons
- Select button
- System ID button
- Non-maskable Interrupt (NMI) button (recessed)

For more information on the LCD panel, see the LCD Panel Features (Optional) section in the About Your System chapter in the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com.

4.11.2 LED Panel Configuration

Figure 10 shows the LED control panel.

Figure 10. LED Control Panel

For a complete description of LED indicators, their causes, and possible courses of action to take to resolve an error, see the Diagnostic Lights (Optional) section in the About Your System chapter in the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com.

4.12 Security

For additional information regarding the following security features, see the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com.

4.12.1 Cover Latch

The PowerEdge T410 comes with a tooled latch on the side cover of the system that secures it to the chassis. A lock secures the cover latch.

4.12.2 Bezel

A bezel is mounted to the front of the chassis. A lock on the bezel is used to protect unauthorized access to remove or install an optional tape backup unit, optical disk drives, or hot-plug hard drives (hot-plug hard drive chassis only). System status on the LCD or LED control panel is viewable even when the bezel is installed.

4.12.3 Hard Drive

For T410 systems with a hot-plug hard drive chassis, the front bezel of the system contains a lock which secures the system hard drives.

For systems with a cabled hard drive chassis, the drives are secured by the cover-latch lock on the side of the system.

4.12.4 TPM

The Trusted Platform Module (TPM) is used to generate and store keys, protect and authenticate passwords, and create and store digital certificates. The TPM can also be used to store Microsoft® BitLocker™ keys for hard drive encryption features in Microsoft Windows Server® 2008. TPM is enabled through a BIOS option.

4.12.5 Power Off Security

The control panel is designed so the power switch cannot be accidentally activated. The lock on the bezel secures the switch behind the bezel. In addition, there is a setting in the CMOS setup that disables the power button function.

4.12.6 Intrusion Alert

A switch mounted on the inside of the chassis, near the 5.25" drive bays, is used to detect chassis intrusion. When the cover is opened, the switch circuit closes to indicate intrusion.

4.12.7 Secure Mode

BIOS has the ability to enter a secure boot mode through Setup. This mode includes the option to lock out the power and NMI switches on the control panel or set up a system password.

For more information, see System and Setup Password Features section in the About Your System chapter in the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com.

4.13 USB Key

The PowerEdge T410 has two ports inside the system on the planar for optional USB keys. Some possible applications of the USB key are listed as follows:

- User custom boot and pre-boot OS for ease of deployment or diskless environments

- USB license keys for software applications like eToken™ or Sentinel Hardware Keys
- Storage of custom logs or scratch pads for portable user defined information (not hot-swappable)

4.14 Battery

A replaceable coin cell CR2032 3V battery is mounted on the planar to provide backup power for the Real-Time Clock and CMOS RAM on the ICH chip.

There is also a battery holder for optional PERC cards which is located under the chassis cover.

4.15 Field Replaceable Units (FRU)

The planar contains a 16K x 8 serial EEPROM to store FRU information including Dell part number, part revision level, and serial number. This part is also used as a system event log (SEL) to be used by the baseboard management controller (BMC).

4.16 User Accessible Jumpers, Sockets, and Connectors

See the Jumpers and Connectors chapter in the *PowerEdge T410 Hardware Owner's Manual* on Support.Dell.com.

5 Power, Thermal, Acoustic

5.1 Power Supplies

The PowerEdge T410 system includes a single non-redundant 525W power supply or an optional redundant 580W power supply.

The power supply subsystem provides power to the planar, six internal hard drive bays (cabled hard drive chassis), the hard drive backplane (hot-plug hard drive chassis), and the two 5.25" drive bays. Power is soft-switched, allowing power cycling using a switch on the front of the system enclosure or through software control (through server management functions). The power system is compatible with industry standards, such as ACPI and Server 2000.

For a redundant power supply configuration, the second power supply provides hot-pluggable power redundancy. In redundant mode, the system distributes the power load across both power supplies to maximize efficiency. When a power supply is removed with the system powered on, the full power load is picked up by the remaining power supply.

If using only one hot-plug power supply, the power supply is installed in the PS1 location and a blank module (metal cover) is installed in the PS2 location for factory consistency. Electrically, the system can operate with a single power supply in either bay. The power supply has automatic input voltage detection. An auxiliary power-out receptacle is not provided on this unit.

The type of power supply can be selected when ordering a system. After purchase, upgrading from a non-redundant to a redundant configuration, or vice-versa, is not possible.

5.2 Power Supply Specifications

Table 4 shows the power supply specifications.

Table 4. **Power Supply Specifications**

Feature	525W Power Supply (Non-redundant)	580W Power Supply (Redundant)
Input Voltage	90–264 VAC	
Auto-ranging	Yes	
Line Frequency	47–63Hz	
Maximum Inrush Current	55A per supply for 10ms or less	
Hot-Plug Capability	No	Yes

5.3 Heat Dissipation

Table 5 details heat dissipation for the PowerEdge T410.

Table 5. **Heat Dissipation**

Description	Non-redundant Power Supply	Redundant Power Supply
Wattage	525W	580W
Heat Dissipation	2240 BTU/hr maximum	2330 BTU/hr maximum

5.4 Environmental Specifications

Table 6 summarizes the environmental specifications for the PowerEdge T410.

Table 6. **Environmental Specifications**

Temperature	
Operating	10° to 35°C (50° to 95°F) with a maximum temperature gradation of 10°C per hour Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-40° to 65°C (-40° to 149°F) with a maximum temperature gradation of 20°C per hour
Relative Humidity	
Operating	20% to 80% (non-condensing) with a maximum humidity gradation of 10% per hour
Storage	5% to 95% (non-condensing) with a maximum humidity gradation of 10% per hour
Maximum Vibration	
Operating	0.25 Grms at 3–200Hz for 15 minutes
Storage	1.54 Grms at 3–200Hz for 15 minutes
Maximum Shock	
Operating	One shock pulse in the positive z axis (one pulse on each side of the system) of 31G for 2.6ms in the operational orientation
Storage	Six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71G for up to 2ms
Altitude	
Operating	-16 to 3048m (-50 to 10,000ft) Note: For altitudes above 2950 feet, the maximum operating temperature is de-rated 1°F/550ft
Storage	-16 to 10,600m (-50 to 35,000ft)
Airborne contaminant level	
Class G1 or lower as defined by ISA-S71.04-1985 (G1 maximum corrosive contaminant levels measured at ≤ 50% relative humidity)	

5.5 Maximum Input Amps

The power supply or power supplies are equipped with automatic input voltage detection.

5.6 ENERGY STAR Compliance

ENERGY STAR® qualified configurations can be accessed from the ENERGY STAR Compliance results landing page on Dell.com.

5.7 Acoustics

The acoustical design of the PowerEdge T410 reflects adherence to Dell's high sound quality standards. Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles or hums. One of the sound quality metrics in the Dell specification is prominence ratio of a tone as shown in Table 7.

Table 7. **Acoustical Performance**

Typical Configuration @ 23 ± 2°C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
DIMM	Power Supply	Hard Drives	RAID				
4 x 1GB	525W cabled	4 x 3.5" SATA (7.2K) 250GB	1 x SAS 6/iR	Idle	5.2	40	None
				Stressed	5.4	44	None

Definitions

Idle: Reference ISO7779 (1999) definition 3.1.7; system is running in its OS but no other specific activity.

Stressed: An operating mode per ISO7779 (1999) definition 3.1.6; SPECPower set to 50% loading is used.

LwA-UL: The upper limit sound power level (LwA) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance to ISO 7779 (1999).

LpA-Op: A-Weighted sound pressure level. The system is placed in center of ISO7779 table, while the acoustic transducer is located 150 cm above the floor and 50 cm in front of the equipment.

Prominent tones: Criteria of D.6 and D.11 of ECMA-74 11th ed. (2010) are followed to determine if discrete tones are prominent. The system is placed in a rack with its bottom at 75-cm from the floor. The acoustic transducer is at front bystander position, ref ISO7779 3rd (2010), Section 8.6.2.

6 Processors

6.1 Overview

The Intel® Xeon® processor 5500 and 5600 series 2S is the microprocessor designed specifically for servers and workstation applications. The Intel Xeon processor 5500 series features quad-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. The Intel 5600 series features six-core processing, offering enhanced system-level performance, virtualization, and energy efficiency. The Intel Xeon processor 5500 and 5600 series also feature Intel's Core™ micro-architecture and Intel 64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The Intel Xeon processor 5500 and 5600 series uses a 1366-contact Flip-Chip Land Grid Array (FC-LGA) package that plugs into a surface mount socket.

The PowerEdge T410 provides support for up to two processors.

Table 8. **Intel Xeon 5500 and 5600 Processor Series Overview**

Feature	5500 Series	5600 Series
# Cores	4	6
Last Level Cache	8MB shared	12MB shared
Multi-processor support	1–2 Processors	1-2 Processors
Front Side Bus (FSB) (MT/s)/ Link Frequency (GT/s)	Up to 6.4 GT/s	Up to 6.4 GT/s
Max Thermal Design Power (TDP)	130W (workstation) 95W (server)	130W (workstation) 95W (server)
Max Frequency	>3GHz	>3GHz
Memory Controller	Integrated 3-channel DDR3	Integrated 3-channel DDR3
Process Technology	45nm	32nm
Intel® Trusted Execution Technology	No	Yes
Intel® Advanced Encryption Security- New Instructions	No	Yes
Intel® Virtualization Technology	Yes	Yes
Intel® 64	Yes	Yes

Feature	5500 Series	5600 Series
Intel® Hyper-Threading Technology	Yes	Yes
Socket	LGA1366	LGA1366

6.2 Features

Key features of the Intel Xeon processor 5500 and 5600 series include:

- Two, four, or six cores per processor
- Two point-to-point QuickPath Interconnect links at 6.4 GT/s
- 1366-pin FC-LGA package
- 32 nm and 45 nm process technology
- No termination required for non-populated processors (must populate CPU socket 1 first)
- Integrated QuickPath DDR3 memory controller 64-byte cache line size RISC/CISC hybrid architecture
- Compatible with existing x86 code base
- Intel MMX™ support—Execute Disable Bit Intel Wide Dynamic Execution
- Ability to execute up to four instructions per clock cycle
- Simultaneous Multi-Threading (SMT) capability
- Support for CPU Turbo Mode (on certain processors)—increases processor frequency if operating below thermal, power, and current limits for streaming SIMD (Single Instruction, Multiple Data) Extensions 2, 3, and 4
- Intel 64 Technology Intel VT-x and VT-d Technology for virtualization support Enhanced Intel SpeedStep® Technology
- Demand-based switching for active processor power management as well as support for ACPI P-States, C-States and T-States
- Support for DDR3L, 1.35v DIMMs for even lower system power (5600 series)
- Support for memory sparing (5600 series)
- AES-NI (hardware encryption assist) for more efficient encryption for uses such as online transactions SSL (5600 series)
- Intel TXT (Trusted Execution Technology) provides hardware assisted protection against emerging software attacks (5600 series)

6.3 Supported Processors

For the latest information on supported processors for the PowerEdge T410, visit Dell.com.

Table 9. **Supported Processors**

Model	Speed	Power	Cache	Cores	QPI Speed
X5660	2.80GHz	95W	12M	6	6.4GT/s
X5650	2.66GHz	95W	12M	6	6.4GT/s
E5649	2.53GHz	80W	12M	6	5.86GT/s
E5645	2.40GHz	80W	12M	6	5.86GT/s
X5560	2.80GHz	95W	8M	4	6.4GT/s

Model	Speed	Power	Cache	Cores	QPI Speed
E5640	2.66GHz	80W	12M	4	5.86GT/s
E5630	2.53GHz	80W	12M	4	5.86GT/s
E5620	2.40GHz	80W	12M	4	5.86GT/s
E5530	2.40GHz	80W	8M	4	5.86GT/s
E5607	2.26GHz	80W	8M	4	4.8GT/s
E5606	2.13GHz	80W	8M	4	4.8GT/s
E5506	2.13GHz	80W	4M	4	4.8GT/s
E5603	1.6GHz	80W	4M	4	4.8GT/s
E5503	2.00GHz	80W	4M	2	4.8GT/s

6.4 Processor Configurations

The PowerEdge T410 will operate with either a single processor or dual processors. However, since the memory controller is embedded in the processor, when only one processor is installed in the system, it supports 4 DIMMs, minimum 1 GB and maximum 64 GB. When two processors are installed in the system, it supports 8 DIMMs, minimum 2 GB and maximum 128 GB.

6.5 Processor Installation

Refer to the Processors section in the Installing System Components chapter of the *Dell PowerEdge T410 Systems Hardware Owner's Manual* on Support.Dell.com for processor installation and removal instructions.

7 Memory

7.1 Overview

The PowerEdge T410 utilizes DDR3 memory, providing a high performance, high-speed memory interface capable of low latency response and high throughput. The T410 supports Registered ECC DDR3 DIMMs (RDIMM) or Unbuffered ECC DDR3 DIMMs (UDIMM).

Key features of the T410 memory system include:

- 3 channels per processor
- 8 (2/1/1) DIMM sockets (128 GB maximum capacity)
- Support for registered ECC DDR3 DIMMs or Unbuffered ECC DDDR3 DIMMs
- DDR3 speeds of 800/1066/1333 supported (maximum memory clock speed depends on the processors selected)
- Support for single-, dual-, and quad-rank DIMMs
- Intel® Xeon® processor 5600 series also supports low voltage (LV) DIMMs and sparing

7.2 DIMMs Supported

The DDR3 memory interface consists of three channels with up to two RDIMMs or UDIMMs per channel for single or dual rank and up to two RDIMMs per channel for quad rank. The following DIMMs are supported by the PowerEdge T410:

- 1 GB, DDR3 UDIMM, 1066 w/ECC
- 1 GB, DDR3 UDIMM, 1333 w/ECC
- 1 GB, DDR3 RDIMM, 1066 w/ECC
- 1 GB, DDR3 RDIMM, 1333 w/ECC
- 2 GB, DDR3 UDIMM, 1066 w/ECC
- 2 GB, DDR3 UDIMM, 1333 w/ECC
- 2 GB, DDR3 RDIMM, 1066 w/ECC
- 2 GB, DDR3 RDIMM, 1333 w/ECC
- 4 GB, DDR3 UDIMM, 1066 w/ECC
- 4 GB, DDR3 UDIMM, 1333 w/ECC
- 4 GB, DDR3 RDIMM, 1066 w/ECC
- 4 GB, DDR3 RDIMM, 1333 w/ECC
- 8 GB, DDR3 RDIMM, 1066 w/ECC
- 8 GB, DDR3 RDIMM, 1333 w/ECC
- 16 GB, DDR3 RDIMM, 1066 w/ECC

For information on the latest memory offerings for the T410, visit Dell.com.

7.3 DIMM Population Rules

The following DIMM population rules apply:

- If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency.
- RDIMMs and UDIMMs cannot be mixed.
- Mixing of ECC and non-ECC UDIMMs will force the system to function in non-ECC mode.
- Mixing quad-rank RDIMMs in one channel and 3DPC in another channel with the same processor socket is not supported.

- DIMMs must be installed in each channel starting with the DIMM slot farthest from the processor (slot 0)
- For each processor, Channel 0 supports up to two DIMMs and Channel 1 and 2 support one DIMM each

7.4 DIMM Slots

The T410 planar provides four 72-bit (240-pin) sockets per processor for DIMM memory modules. These modules can be DDR3 800/1066/1333 Registered DIMMs. The DIMMs are configured as 72 bits wide to provide for ECC, which is performed by the memory controller in the processor.

7.5 Low Voltage DIMMs

With the introduction of the Intel® Xeon® processor 5600 series, low voltage (LV) DIMMs have been added for selected memory configurations for the PowerEdge T410. Only this processor series supports operating DIMMs at the lower voltage (1.35V, also referred to as DDR3L). The Intel Xeon 5500 processor series does not support low voltage operation. However, they can be operated at 1.5V. Therefore, DDR3L DIMMs can be used in systems with either processor series, and the platform will automatically choose the appropriate operating voltage based on the processor populated. DDR3L DIMMs will be qualified and available for use with Intel Xeon 5500 processor series mid-year 2011. Contact your Dell Sales Representative or visit Dell.com for more information.

LV DIMMs operate at 1.35V, creating power savings vs. standard memory which operates at 1.5V. In order to achieve power savings, all DIMMs in the system must be of the LV type. If the system detects a mixture of standard and LV DIMMs, the BIOS will operate all memory at 1.5V. When operating at the lower voltage, additional frequency and population restrictions can take effect. For example, 3 DIMMs per channel operation is not supported at low voltage.

The DDR3L standard is completely backwards-compatible at standard voltage. DDR3L DIMMs can operate at 1.5V without any limitations beyond standard voltage DDR3 DIMMs. As part of the addition of LV DIMMs, the platform has certain default behaviors. Whenever possible, if there is no performance degradation, the platform will default to 1.35V operation when using DDR3L DIMMs. In certain cases, where a configuration is populated that cannot support 1.35V or a performance degradation would result, the platform defaults to 1.5V operation. There are also options to override default voltage within allowed limits.

7.6 Speed

The memory speed of each channel depends on the memory configuration:

- For single- or dual-rank memory modules:
  - One memory module per channel supports up to 1333 MT/s
  - Two memory modules per channel supports up to 1066 MT/s
- For quad-rank memory modules:
  - One memory module per channel supports up to 1066 MT/s
  - Two memory modules per channel are limited to 800 MT/s, regardless of memory module speed

If memory modules with different speeds are installed, they will operate at the fastest common frequency of the installed memory module(s).

7.7 Sparing

Systems with the Intel Xeon processor 5600 series support memory sparing. Sparing requires identical memory installed in all three channels. One of the three channels is considered the Spare Channel,

and two-thirds of the total installed memory is usable and is the amount reported during POST and in BIOS setup.

7.8 Mirroring

The T410 system supports memory mirroring if identical memory modules are installed in the first two channels and no memory is installed in the 3rd channel. Mirroring must be enabled in the System Setup program. In a mirrored configuration, the total available system memory is one-half of the total installed physical memory.

7.9 Supported Configurations

See the System Memory section in the Installing System Components chapter in the *Dell PowerEdge T410 Systems Hardware Owner's Manual* on Support.dell.com.

8 Chipset

8.1 Overview

Introduction of the new Intel® Xeon® processor 5600 series includes a stepping revision of the Intel 5520 and 5500 chipset, which is required to enable the full 5600 series feature set. Dell servers shipped with the new chipset revision have the symbol II in the System Revision Field visible through Dell OpenManage™ Server Administrator (OMSA) and the iDRAC GUI. They are physically marked with a 12 mm x 6 mm rectangular label containing the symbol II. The memory interface is optimized for 800/1066/1333 MT/s DDR3 SDRAM memory with ECC when running with Intel Xeon processor 5600 series.

8.2 Intel 5500 Chipset Features

The following high-level features are supported by the Intel 5500 chipset:

- Intel® 5500 IOH Chipset (north bridge)
- Intel QuickPath interconnect: 2 ports
- ESI interface: x4 lanes
- Intel Virtualization Technology
- 24 PCIe Gen2 lanes
- Riser card (x16 slot + x8 slot) connecting to IOH PCIe x16 Gen 2 and IOH PCIe x4 Gen 2
- Integrated Intel® Management Engine
- JTAG support
- Intel ICH10R Chipset (south bridge)
- Integrated USB 2.0 with 12-port capability
  - Two back ports from ICH10R
  - Two front ports
  - Two internal ports from the USB hub (1 port from ICH10R) on the front panel board
- Integrated storage controllers
- Six SATA channels (through ICH10R)
- Maximum of one SATA drive (300MB/s, Gen 2) on each channel

8.2.1 Intel QuickPath Interconnect

Intel QuickPath Interconnect features include:

- Point-to-point cache-coherent interconnect
- Fast/narrow unidirectional links
- Concurrent bi-directional traffic
- Error detection via CRC
- Error correction via Link level retry
- Intel® Interconnect BIST (Intel IBIST) toolbox built-in
- Packet-based protocol

8.2.2 PCI Express Interfaces

PCI Express Interfaces include:

- Intel® 5500 chipset IOH provides multiple PCI Express Gen 2 interfaces
- Point-to-point, serial bi-directional interconnect
- One x4 ESI link to ICH10

- Up to six x4 PCI Express Gen 2 ports
- x4 link pairs can be combined to form x8 links and or x16 links
- Each signal is 8b/10b encoded with an embedded clock
- Signaling bit rate of 5 Gbit/sec/lane/direction; for an x4 link, bandwidth is 2 GB/sec in each direction
- Hot insertion and removal supported with the addition of hot-plug control circuitry

8.2.3 SMBus Interfaces

SMBus Interfaces include:

- Global connections to processors, IOHs, and ICH through a common shared bus hierarchy
- Low pin count, low-speed management interface
- Access to configuration status registers (CSR)
- Mastered by the baseboard management controller (BMC)

8.2.4 ESI interface

The ESI interface connects the Intel® 5500 chipset MCH to the ICH10R. The ESI interface runs at 2 GB/s with a 100 MT/s reference clock.

8.3 Intel ICH10R South Bridge

The PowerEdge T410 planar incorporates the Intel ICH10R chip. The ICH10R is a highly integrated I/O controller.

8.3.1 SATA interface

The ICH10R contains 6 integrated Serial ATA host controllers capable of independent DMA operation on 6 ports.

The ICH10R SATA interface supports data transfers up to 300 MB/s. The ICH10R has an integrated AHCI controller.

8.3.2 USB interface

The ICH10R is USB 2.0 compliant. It has six UHCI host controllers to support twelve ports and two EHCI host controller to support twelve ports. An over-current condition can be detected on all twelve ports.

9 BIOS

9.1 Overview

The T410 BIOS is based on the Dell BIOS core, supporting the following features:

- Intel® 5500 2S support
- Simultaneous Multi-Threading (SMT) support
- CPU Turbo Mode support
- PCI 2.3 compliant
- Plug and Play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Ability to boot from hard drive, optical drive, iSCSI drive, and USB key
- ACPI support
- Direct Media Interface (DMI) support
- PXE and WOL support for on-board NICs
- Memory mirroring support
- SETUP access through <F2> key at end of POST
- USB 2.0 (USB boot code is 1.1 compliant)
- F1/F2 error logging in CMOS
- Virtual KVM, CD, and floppy support
- Unified Server Configurator support
- Power management support including DBS, Power Inventory, and multiple Power Profiles
- UEFI support
- Intel TXT (5600 processor series)
- Intel AESNI (5600 processor series)

The T410 BIOS does not support the following:

- BIOS language localization
- BIOS recovery after bad flash (can be recovered from iDRAC6 Express)

9.2 Supported ACPI States

- ACPI compliance: OS, S4, S5 supported
- NO S1, S2, S3 (STR) support

Table 10. **Wake-Up States**

Wake-Up Events	States Can Wake From
RTC	OS-S4
Power Button	S5
RI#	Not supported
PME#	S5
KB	Not supported
MOUSE	Not supported
USB	Not supported
WOL	OS-S4

9.3 BIOS Power Management

The T410 BIOS provides a Performance/Power page in the BIOS configuration screen, and these BIOS features are consolidated into a single page. The BIOS will also provide user-friendly Power Profiles that adjust various BIOS settings.

Concerning the Power Profiles, some of the power management settings can be grouped together. A group of a set of different parameters is called Power Profile. The BIOS setup provides five options: OS Control, Active Power Controller, Static Max Performance, and Custom. OS Control mode is the default mode.

9.4 I^2C (Inter-Integrated Circuit)

I^2C is a simple bi-directional two-wire bus for efficient inter-integrated circuit control. All I^2C -bus compatible devices incorporate an on-chip interface that allows them to communicate directly with each other via the I^2C-bus. This solves the many interfacing problems encountered when designing digital control circuits. These I^2C devices perform communication functions between intelligent control devices (e.g., microcontrollers), general-purpose circuits (e.g., LCD drivers, remote I/O ports, memories), and application-oriented circuits.

10 Embedded NICs/LAN on Motherboard (LOM)

The PowerEdge T410 has an embedded dual-port Gigabit Ethernet controller. The embedded Broadcom® 5716 dual-port LAN controller is on the T410 planar as an independent Gigabit Ethernet interface device. There are two RJ-45 connectors on the back of the system. The firmware for the LOM chip resides in a flash part. The PowerEdge T410 supports Wake-On-LAN (WOL) from either port.

11 I/O Slots

11.1 Overview

The PowerEdge T410 has five PCI Express expansion slots which are detailed as follows:

- One x16 PCIe Gen2 slot for a full-height half-length card
- Two x8 PCIe Gen2 slots for full-height full-length cards
- One x8 PCIe Gen2 slot for a full-height half-length card
- One x8 PCIe Gen1 slot for a full-height full-length card

The system supports 25W maximum power for all PCIe cards. The system does not support hot-plugging or hot-removal of PCIe cards.

11.2 Quantities and Priorities

For information on expansion-card quantities and priorities, see the Expansion Cards section in the Installing System Components chapter of the *Dell PowerEdge T410 Systems Hardware Owner's Manual* on Support.dell.com.

11.3 PCI Card Dimensions

For information about PCIe slots and card dimensions, see the Expansion Cards section in the Installing System Components chapter in the *Dell PowerEdge T410 Systems Hardware Owner's Manual* on Support.Dell.com.

12 Storage

12.1 Overview

The PowerEdge T410 is available in either a cabled hard-drive chassis configuration or a hot-swap hard-drive chassis configuration. The following hard-drive configurations are available:

- 4 x 3.5” cabled SATA drives using the motherboard SATA connectors
- 6 x 3.5” cabled SAS or SATA drives using an optional storage controller
- 6 x 3.5” hot-plug SAS or SATA drives using an optional storage controller
- 6 x 2.5” hot-plug SAS, SATA, or SSD drives using an optional storage controller

The use of 2.5” hard drives requires the hot-plug chassis configuration and the Dell 3.5” hard drive carrier and retention kit.

Upgrading between cabled and hot-plug configurations is not possible after purchase.

12.2 Internal Hard Disk Drives

The T410 system supports up to six 2.5” or 3.5” hard disk drives. See Table 11 for information on supported hard drives. For the most up-to-date information on supported hard drives, visit Dell.com.

Table 11. **Supported Hard Drives**

Form Factor	Capacity	Speed	Type
2.5”	146GB, 300GB, 600GB, 900GB	10K	SAS
2.5”	50GB, 100GB	N/A	SATA SSD
3.5”	250GB, 500GB, 1TB, 2TB	7.2K	SATA
3.5”	500GB, 1TB, 2TB, 3TB	7.2K	NL SAS
3.5”	146GB, 300GB, 450GB, 600GB	15K	SAS

12.3 RAID Configurations

Table 12 details RAID configurations for the PowerEdge T410.

Table 12. **Factory RAID Configurations**

Factory Configuration					Non-Mixed drives all SATA, all SAS, or all SSD; all 2.5” or all 3.5”	
Cabled/ Hot-plug	Config Type	Configs		Description	Min HDD	Max HDD
Cabled	No Hard Drive	C0A	NCZCBL	No HDD, Cabled HDD Chassis	0	0
Hot-plug	No Hard Drive	C0B	NCZ	No HDD, Hot-plug HDD Chassis	0	0
Cabled	Embedded SATA	C1	MSTCBL	Onboard SATA Controller (ICH10R)	1	4

Factory Configuration					Non-Mixed drives all SATA, all SAS, or all SSD; all 2.5" or all 3.5"	
Cabled/ Hot-plug	**Config Type**	**Configs**		**Description**	**Min HDD**	**Max HDD**
	SAS/SATA—No RAID	C2	ASSCBL	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR, PERC H200)	1	6
	SAS/SATA—RAID 0	C3	ASSR0CBL	Add-in SAS/SATA RAID card, RAID 0 (SAS 6/iR, PERC 6/i, PERC H200, PERC H700)	1	4
	SAS/SATA—RAID 1	C4	ASSR1CBL	Add-in SAS/SATA RAID card, RAID 1 (SAS 6/iR, PERC 6/i, PERC H700, PERC H200)	2	2
	SAS/SATA—RAID 5	C5	ASSR5CBL	Add-in SAS/SATA RAID card, RAID 5 (PERC H700)	3	4
	SAS/SATA—RAID 6	C6	ASSR6CBL	Add-in SAS/SATA RAID card, RAID 6 (PERC H700)	4	4
Hot-plug	SAS/SATA /SSD—NO RAID	C7	ASS	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR, PERC H200)	1	6
	SAS/SATA /SSD—RAID 0	C8	ASSR0	Add-in SAS/SATA RAID card, RAID 0 (SAS 6/iR, PERC 6/i, PERC H700, PERC H200)	1	6
	SAS/SATA /SSD—RAID 1	C9	ASSR1	Add-in SAS/SATA RAID card, RAID 1 (SAS 6/iR, PERC 6/i, PERC H700, PERC H200)	2	2
	SAS/SATA/SSD —No RAID	C10	ASS	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR, PERC H200)	1	4
	SAS/SATA/SSD —RAID	C11	ASSR0	Add-in SAS/SATA RAID card, RAID 0 (SAS 6/iR, PERC 6/i, PERC H200, PERC H700)	1	4
	SAS/SATA /SSD—RAID 10	C12	ASSR1	Add-in SAS/SATA RAID card, RAID 1 (SAS 6/iR, PERC 6/i, PERC H200, PERC H700)	2	2
	SAS/SATA /SSD—RAID 1 + RAID 1	C13	ASSR5	Add-in SAS/SATA RAID card, RAID 5 (PERC H700)	3	4
	SAS/SATA /SSD—RAID 1 + RAID 5	C14	ASSR6	Add-in SAS/SATA RAID card, RAID 6 (PERC H700)	4	4

Factory Configuration					Non-Mixed drives all SATA, all SAS, or all SSD; all 2.5” or all 3.5”	
Cabled/ Hot-plug	**Config Type**	**Cabled/ Hot-plug**		**Config Type**	**Cabled/ Hot-plug**	**Config Type**
Cabled	SW RAID (ICH)	C18A	MSTR0CBL	RAID 0 for 2 drives (PERC S100)	2	2
		C18B	MSTR0CBL	RAID 0 for 3 and above HDDs (PERC S100)	3	4
		C19	MSTR1CBL	RAID 1 (PERC S100)	2	2
		C20	MSTR10CBL	RAID 10 (PERC S100)	4	4
		C21	MSTR5CBL	RAID 5 (PERC S100)	3	4
	SW RAID (Add-in Card)	C22A	ASSR0CBL	RAID 0 for 2 drives (PERC S300)	2	2
		C22B	ASSR0CBL	RAID 0 for 3 and above drives (PERC S300)	3	6
Mixed Hard Drive (SAS + SATA) Factory Configuration					**Mixed SAS + SATA Min: 2xSAS+1xSATA Max: 2xSAS+4xSATA; all 2.5” or 3.5”**	
Cabled/ Hot-plug	**Config Type**	**Configs**		**Description**	**Min HDD**	**Max HDD**
Hot-plug	Mix SAS and SATA—No RAID	C15	ASS-X	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR, PERC H200)	2xSAS + 1xSATA	2xSAS + 4xSATA
	Mix SAS and SATA—RAID 1 + RAID 1	C16	ASSR1R1-X	Add-in SAS/SATA RAID card, RAID 1 + RAID 1 (SAS 6/iR, PERC 6/i, PERC H700, PERC H200)	2xSAS + 2xSATA	2xSAS + 2xSATA
	Mix SAS and SATA—RAID 1 + RAID 5	C17	ASSR1R5-X	Add-in SAS/SATA RAID card, RAID 1 + RAID 5 (PERC 6/i, PERC H700)	2xSAS + 3xSATA	2xSAS + 4xSATA

12.4 Storage Controllers

The PowerEdge T410 supports the storage controllers listed below. For information on card quantities and priorities, see the Expansion Cards section in the Installing System Components chapter of the *Dell PowerEdge T410 Systems Hardware Owner’s Manual* on Support.dell.com.

12.4.1 SAS 6/iR

The T410 internal SAS 6/iR HBA is an expansion card that plugs into one of the PCI Express x8 slots (four lanes wired). It incorporates two four-channel SAS IOCs for connection to SAS or SATA hard disk drives.

12.4.2 PERC 6/i

If you want an internal RAID solution, select the PERC 6/i or PERC H700. The PERC 6/i uses the LSI 1078 ROC (RAID on Chip) processor with a PCI Express host interface and DDR2 memory. A battery is also available for backup.

12.4.3 PERC H200

The H200 SAS HBA is an expansion card that plugs into one of the PCI Express x8 slots. It incorporates two four-channel 6 Gb/s SAS IOCs for connection to SAS hard disk drives. It is designed in a form factor that allows the same card to be used in other 11G 2U rack-form factor platforms.

12.4.4 PERC H700

If you want an internal RAID solution, select the PERC H700 or PERC 6/i. The PERC H700 card has its own processor with a PCI Express Gen2 host interface and DDR2 memory and installs into one of the PCI Express x8 slots. A battery is also available for backup. It supports the internal 6 Gb/s backplane interface for internal storage options (SAS, SATA, or SSD HDD). The PowerEdge T410 supports both 256MB and 512MB cache options on the internal H700.

12.4.5 PERC H800

The PowerEdge T410 can support up to two PERC H800 adapter cards installed in the PCI Express x8 slots for access to external SAS direct-attach storage. Features of the PERC H800 include:

- LSI 2108 (Liberator) ROC
- 6 Gb/s SAS
- PCIe Gen2 x8
- 800 MT/s Core PPC
- DDR2 800 mini-DIMM
- Dual mini-SAS connectors
- Supports connection to 6 Gb/s enclosures only

12.5 Optical Drives

Optical drives are optional in all PowerEdge T410 systems and connect to the planar through the SATA interface. The following internal optical drives are available on the PowerEdge T410:

- DVD-ROM
- DVD+RW

If optical or tape drives are not ordered with the system, blanks are installed in the empty 5.25” bays.

12.6 Tape Drives

Internal and external tape drives and tape libraries are supported. For more information on supported tape drives and tape libraries, see Dell.com/Storage.

13 Video

The PowerEdge T410 is equipped with a Matrox® G200eW with 8 MB memory integrated in the Nuvoton® WPCM450 (Baseboard Management Controller [BMC]). Supported resolutions are listed in Table 13.

Table 13. **Graphics Video Modes**

Resolution	Refresh Rate (Hz)	Color Depth (bit)
640 x 480	60, 72, 75, 85	8, 16, 32
800 x 600	60, 72, 75, 85	8, 16, 32
1024 x 768	60, 72, 75, 85	8, 16, 32
1152 x 864	75	8, 16, 32
1280 x 1024[1]	60	32
1280 x 1024[2]	60, 75, 85	8, 16
[1]32 bit color only supported at 60Hz for this resolution. [2]85Hz for KVM and 1600x1200 at 60Hz for video out.		

14 Rack Information

Dell does not provide rack support for the PowerEdge T410. However, the system can be placed in a rack enclosure using a 3rd party tray.

15 Operating Systems

For detailed information, see the following:

- Operating System Support Matrix for Dell PowerEdge Systems on www.Dell.com
- *Dell PowerEdge T410 Systems Getting Started Guide* on Support.Dell.com

16 Systems Management

16.1 Overview

Dell delivers open, comprehensive, and integrated solutions that help you reduce the complexity of managing disparate IT assets. Combining Dell PowerEdge Servers with a wide selection of Dell developed systems management solutions gives you choice and flexibility, so you can simplify and save in IT environments of any size. To help you meet your server management demands, Dell offers Dell OpenManage™ systems management solutions for:

- Deployment of one or many servers from a single console
- Monitoring of server and storage health and maintenance
- Update of system, operating system, and application software

Dell offers IT management solutions for organizations of all sizes—priced and sized appropriately and supported comprehensively.

16.2 Server Management

A Dell Systems Management and Documentation DVD and a Dell Management Console DVD are included with the product. ISO images are also available. A brief description of available content:

- Dell Systems Build and Update Utility (SBUU): Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.
- Server Update Utility (SUU): This DVD has an inventory tool for managing updates to firmware, BIOS, and drivers for either Linux or Windows varieties.
- OpenManage Server Administrator (OMSA): The OpenManage Server Administrator tool provides a comprehensive, one-to-one (one console to one server) systems management solution, designed for system administrators to manage systems locally and remotely over a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.
- Management Console: Dell IT Assistant (ITA) is also included, as well as tools to allow access to our remote management products. These tools are Remote Access Service for iDRAC and the Baseboard Management Controller (BMC) Utility.
- Active Directory Snap-in Utility: The Active Directory Snap-in Utility provides an extension snap-in to the Microsoft Active Directory. This allows you to manage Dell specific Active Directory objects. The Dell-specific schema class definitions and their installation are also included on the DVD.
- Dell Systems Service Diagnostics Tools: Dell Systems Service and Diagnostics tools deliver the latest Dell optimized drivers, utilities, and operating system-based diagnostics that you can use to update your system.
- eDocs: The section includes PDF files for PowerEdge systems, storage peripherals, and Dell OpenManage™ software.

- Dell Management Console (DMC): The Dell Management Console is a systems management console that enables systems administrators to discover and inventory devices on your network. It provides functions such as health and performance monitoring of networked devices and patch management capabilities for Dell systems. DMC differs from the IT Assistant management console (described above) in that with DMC, value-add plug-ins that enable advanced functionality can be purchased and added to the base DMC product.

16.3 Embedded Server Management

The PowerEdge T410 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The optional iDRAC (Integrated Dell Remote Access Controller) is responsible for acting as an interface between the host system and its management software and the periphery devices. These periphery devices consist of the power supplies, the storage backplane, the integrated SAS HBA or PERC 6/I (PERC H700), and the control panel with LCD display.

The optional upgrade to iDRAC6 provides features for managing the server remotely or in data center lights-out environments.

Advanced iDRAC features require the installation of the optional iDRAC6 Enterprise card.

16.4 Dell Lifecycle Controller and Unified Server Configurator

Embedded management is comprised of several interdependent pieces:

- Dell Lifecycle Controller
- Unified Server Configurator
- iDRAC6

Dell Lifecycle Controller powers the embedded management features. It includes integrated and tamper-proof storage for system-management tools and enablement utilities (firmware, drivers). For servers with iDRAC6 Express, the Lifecycle Controller offers pre-OS server deployment, OS installation, platform updates, platform configuration, and diagnostics capabilities. For servers without iDRAC6 Express, this utility has limited functionality and offers OS installation and diagnostics capabilities only.

Dell Unified Server Configurator (USC) is a graphical user interface (GUI) that aids in local server provisioning in a pre-OS environment. To access the Unified Server Configurator, press the <F10> key within 10 seconds of the Dell logo appearance during the system boot process. Table 14 details the current functionality enabled by the USC.

Table 14. **Unified Server Configurator Features and Description**

Feature	Description
Faster O/S Installation	Drivers and the installation utility are embedded on system, so no need to scour Dell.com.
Faster System Updates	Integration with Dell support automatically directed to latest versions of the Unified Server Configurator, iDRAC, RAID, BIOS, NIC, and Power Supply.
Update Rollback	Ability to recover to previous “known good state” for all updatable components.
More Comprehensive Diagnostics	Diagnostic utilities are embedded on system.

Feature	Description
Simplified Hardware Configuration	Detects RAID controller and allows user to configure virtual disk and choose virtual disk as boot device, eliminating the need to launch a separate utility. Also provides configuration for iDRAC, BIOS, and NIC/LOM.

16.5 Integrated Dell Remote Access Controller

The integrated Dell Remote Access Controller (iDRAC6) provides IT Administrators comprehensive yet straightforward management of remote servers, by delivering "as if you are there" presence and control. iDRAC6 helps users to save time and money by eliminating travel to the remote server(s), whether that server is located in a different room, a different building, a different city, or in a different country. iDRAC6 is a purchasable option and is available as three offerings: iDRAC6 Express, iDRAC6 Enterprise, and Virtual Flash (vFlash) media:

- iDRAC6 Express is most appropriate for small-to-medium business customers with limited remote management needs.
- iDRAC6 Enterprise is appropriate for large data center customers with distributed servers.
- iDRAC6 with vFlash media is provided for large enterprise customers with requirements for system management automation.

16.6 iDRAC6 Express

The optional iDRAC6 Express is the first tier of iDRAC6 upgrades. In addition to upgrading the system with a Lifecycle Controller, iDRAC6 Express offers the following key features:

- Graphical web interface
- Standard-based interfaces
- Server Sensor monitoring and fault alerting
- Secure operation of remote access functions including authentication, authorization, and encryption
- Power control and management with the ability to limit server power consumption and remotely control server power states
- Advanced troubleshooting capabilities

For more information on iDRAC6 Express features, see Table 15.

16.7 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the T410 planar and is mounted parallel to the planar with stand-offs.

Key features for the iDRAC6 Enterprise include:

- Scripting capability with Dell's Racadm command-line
- Remote video, keyboard, and mouse control with Virtual Console
- Remote media access with Virtual Media
- Dedicated network interface

16.8 iDRAC6 Enterprise with Virtual Flash (vFlash) Media

The iDRAC6 Enterprise can be upgraded by adding the vFlash media card. This is an 8 GB Dell-branded SD card that enables a persistent 256 MB virtual flash partition. The vFlash media delivers the following key features:

- Support for 8 GB SD storage media
- Can be used as a repository for a pre-OS image, eliminating the need to maintain a network infrastructure for OS deployment
- Can also be used for permanent diagnostics image for use after system failures, or permanent failsafe image for periodic configuration changes

A more detailed feature list for iDRAC6 Express, iDRAC6 Enterprise, and vFlash media is shown in Table 15.

Table 15. **Features List for Base Management Functionality, iDRAC6, and vFlash Media**

Feature	Base Management Functionality	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
Interface and Standards Support				
IPMI 2.0	✓	✓	✓	✓
Web-based GUI		✓	✓	✓
SNMP		✓	✓	✓
WSMAN		✓	✓	✓
SMASH-CLP		✓	✓	✓
Racadm command-line			✓	✓
Conductivity				
Shared/Failover Network Modes	✓	✓	✓	✓
IPv4	✓	✓	✓	✓
VLAN Tagging	✓	✓	✓	✓
IPv6		✓	✓	✓
Dynamic DNS	✓	✓	✓	✓
Dedicated NIC			✓	✓
Security and Authentication				
Role-based Authority	✓	✓	✓	✓
Local Users	✓	✓	✓	✓
Active Directory		✓	✓	✓
SSL Encryption		✓	✓	✓

Feature	Base Management Functionality	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
Remote Management and Remediation				
Remote Firmware Update	✓	✓	✓	✓
Server power control	✓	✓	✓	✓
Serial-over-LAN (with proxy)	✓	✓	✓	✓
Serial-over-LAN (no proxy)		✓	✓	✓
Power capping		✓	✓	✓
Last crash screen capture		✓	✓	✓
Boot capture		✓	✓	✓
Serial-over-LAN		✓	✓	✓
Virtual media			✓	✓
Virtual console			✓	✓
Virtual console sharing			✓	✓
Virtual flash				✓
Monitoring				
Sensor Monitoring and Alerting	✓	✓	✓	✓
Real-time Power Monitoring	✓	✓	✓	✓
Real-time Power Graphing	✓	✓	✓	✓
Historical Power Counters	✓	✓	✓	✓
Logging Features				
System Event Log	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log			✓	✓

17 Peripherals

The T410 supports the following USB devices:

- DVD-ROM
- DVD+RW
- USB key (bootable)

Appendix A. Statement of Volatility

The Dell PowerEdge T410 contains both volatile and non-volatile (NV) components. Volatile components lose their data immediately upon removal of power from the component. Non-volatile components continue to retain their data even after the power has been removed from the component. Components chosen as user-definable configuration options (those not soldered to the motherboard) are not included in the Statement of Volatility. Configuration option information (pertinent to options such as microprocessors, system memory, remote access controllers, and storage controllers) is available by component separately. The non-volatile (NV) components detailed in Table 16 are present in the PowerEdge T410 server.

Table 16. **Volatility Table**

Server BIOS Memory	**Details**
Size:	32 Mbit
Type [e.g. Flash PROM, EEPROM]:	Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	Boot Code and Configuration Information
How is data input to this memory?	Loading flash memory requires a vendor-provided firmware file and loader program which is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Remarks	
Server CMOS (Complementary Metal-Oxide Semiconductor) Memory	**Details**
Size:	512 Bytes
Type: [e.g. Flash PROM, EEPROM]:	Battery backed NVRAM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	RTC & Configuration settings
How is data input to this memory?	F2 Setup Menu during POST
How is this memory write protected?	N/A
Remarks	Jumper on motherboard can be used to clear to factory default settings

LOM (LAN [Network Interface] on Motherboard) Memory	Details
Size:	4Mb (1MB)
Type: [e.g. Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	Yes, under software control.
Purpose? [e.g. boot code]	Contains LOM boot code and config data
How is data input to this memory?	Requires vendor provided firmware file and loader program used during factory assembly or possible field update. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software control.
Remarks	
Server System FRU	**Details**
Size:	16 KB
Type: [e.g. Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	Store System Events
How is data input to this memory?	BMC controller write
How is this memory write protected?	Not write protected
Remarks	
Power Supply FRU	**Details**
Size:	256 Bytes
Type: [e.g. Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	Store power supply information
How is data input to this memory?	Programmed by the power supply manufacturer.
How is this memory write protected?	Not write protected
Remarks	
TPM (Trusted Platform Module; boards sold to destinations in China do not have TPM at this time.)	**Details**
Size:	Unspecified size of user ROM, RAM, EEPROM; 128 bytes of OTP memory included
Type: [e.g. Flash PROM, EEPROM]:	ROM, RAM, EEPROM

Can user programs or operating system write data to it during normal operation?	Yes, OS's and applications that conform to the TCG standard can write data to the TPM during normal operation. Access to the NV Storage is controlled by the TPM owner.
Purpose? [e.g. boot code]	Trusted Platform Module NV storage. May be used to securely storage of encryption keys.
How is data input to this memory?	TCG TPM Specification defined command interface or Using TPM Enabled operating systems
How is this memory write protected?	As defined by the TCG TPM Specification, protection of this NV memory area is configurable by the TPM owner.
Remarks	
Backplane Firmware and FRU	**Details**
Size:	32 KB
Type: [e.g. Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	Backplane Firmware and FRU data storage
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. A system loaded with arbitrary data in firmware memory would not operate.
Embedded Bootable Memory Device	**Details**
Size:	1 GB
Type: [e.g. Flash PROM, EEPROM]:	SD card
Can user programs or operating system write data to it during normal operation?	Yes
Purpose? [e.g. boot code]	Optional embedded boot device
How is data input to this memory?	Factory installed or via USB bus.
How is this memory write protected?	Not write protected
Remarks	
Server BMC (Baseboard Management Controller) Firmware Flash Memory	**Details**
Size:	16MB Flash
Type: [e.g. Flash PROM, EEPROM]:	SPI Flash

Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g. boot code]	Stores the BMC Firmware
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Remarks	

To obtain optional component information, please refer to the Dell Statement of Volatility for the individual components. Please direct any questions to your Dell Marketing contact.

Appendix B. Certifications

A.1 Regulatory Certifications

Regulatory compliance certificates can be located at the following sites:

- http://www.dell.com/content/topics/global.aspx/about_dell/values/regulatory_compliance/dec_conform?c=us&l=en&s=corp

A.2 Product Safety Certifications

The product has been certified and bears the Mark, as applicable, of the Product Safety authorities as indicated in Table 17.

Table 17. **Product Safety Certifications**

Country/Region	Authority or Mark
Argentina	IRAM
Belarus	BELLIS
Canada	SCC
China	CNCA or CCC
Croatia	KONCAR
European Union	CE
Germany	TUV
IECEE	IECEE CB
Israel	SII
Kazakhstan	OTAN – CKT
Kenya	KEBS
Kuwait	KUCAS
Mexico	NYCE or NOM
Moldova	INSM
Nigeria	SONCAP
Norway	NEMKO
Russia	GOST
Saudi Arabia	KSA ICCP
South Africa	NRCS
Taiwan	BSMI
Ukraine	UKRTEST or UKRSERTCOMPUTER
United States	NRTL
Uzbekistan	STZ

A.3 Electromagnetic Compatibility

The product has been certified and bears the Mark, as applicable, of the EMC authorities as indicated in Table 18.

Table 18. **Electromagnetic Compatibility Certifications**

Country/Region	Authority or Mark	Class
Australia/New Zealand	ACMA or C-Tick	Class A
Belarus	BELLIS	Class A
Bosnia & Herzegovina, Montenegro, Serbia	KVALITET	Class A
Canada	ICES	Class A
China	CNCA or CCC	Class A
Croatia	KONCAR	Class A
European Union	CE	Class A
Israel	SII	Class A
Japan	VCCI	Class A
Kazakhstan	OTAN – CKT	Class A
Moldova	INSM	Class A
Norway	NEMKO	Class A
Russia	GOST	Class A
South Africa	SABS	Class A
South Korea	KCC	Class A
Taiwan	BSMI	Class A
Ukraine	UKRTEST or UKRSERTCOMPUTER	Class A
United States	FCC	Class A
Uzbekistan	STZ	Class A
Vietnam	ICT	Class A

A.4 Ergonomics, Acoustics and Hygienics

The product has been certified and bears the Mark, as applicable, of the Ergonomics, Acoustics and Hygienics authorities as indicated in Table 19.

Table 19. **Ergonomics, Acoustics and Hygienics**

Country/Region	Authority or Mark
Belarus	BELLIS
Germany	GS
Russia	GOST

Appendix C. Additional Information and Options

The PowerEdge T410 system conforms to the industry standards detailed in Table 20.

Table 20. Industry Standards

Standard	URL for Information and Specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	http://www.acpi.info/
Energy Star EPA Version 1.0 of the Computer Server specification	http://www.energystar.gov/index.cfm?c=archives.enterprise_servers
Ethernet IEEE 802.3-2005	http://standards.ieee.org/getieee802/802.3.html
IPMI Intelligent Platform Management Interface, v2.0	http://www.intel.com/design/servers/ipmi/
DDR3 Memory DDR3 SDRAM Specification, Rev. 3A	http://www.jedec.org/download/search/JESD79-3A.pdf
LPC Low Pin Count Interface Specification, Rev. 1.1	http://developer.AMD.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0	http://www.pcisig.com/specifications/pciexpress/
PMBus Power System Management Protocol Specification, v1.1	http://pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	http://www.t10.org/cgi-bin/ac.pl?t=f&f=sas1r10.pdf
SATA Serial ATA Rev. 2.6; SATA II, Extensions to SATA 1.0a, Rev. 1.2	http://sata-io.org/
SMBIOS System Management BIOS Reference Specification, v2.6	http://www.dmtf.org/standards/smbios/
TPM Trusted Platform Module Specification, v1.2	http://www.trustedcomputinggroup.org/resources/tpm_main_specification
UEFI Unified Extensible Firmware Interface Specification, v2.1	http://www.uefi.org/specs/

Standard	URL for Information and Specifications
USB Universal Serial Bus Specification, Rev. 2.0	http://www.usb.org/developers/docs/
Windows Logo Windows Logo Program System and Device Requirements, v3.10	http://www.microsoft.com/whdc/winlogo/hwrequirements.mspx